Progress Report on Princeton University

NASA Contract NsG 196-61

April 1965 Through October 1965

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During the past six months the following investigations were completed:

1. Calibration curves were made for semiquantitative estimates of the proportion of the following minerals, shown in Figures 1 through 4.

quartz-cristobalite
quartz-tridymite
cristobalite-tridymite
cristobalite-orthoclase

The current study has shown that the distinct mineral species of silica, SiO_2, are more common in siliceous volcanic rocks than was formerly realized. Quartz and cristobalite are often associated with tridymite in the Japanese dacitic and rhyolitic lavas collected and donated for study to Princeton by Professor Kuno of Tokyo University. Tridymite is an abundant mineral, sometimes the chief silica mineral of these rocks. Inasmuch as lunar surface material may consist of similar volcanics, the quantitative relations of the SiO_2 phases was determined. Synthetic cristobalite and tridymite were used for the calibration.

2. A chemically analyzed olivine nodule from Ludlow, California was examined by x-ray diffraction to determine weight percentages of component minerals using the calibration curves of our previous reports. Weight percentages of minerals were converted by use of stoichiometric formulas to give the chemical composition of the rock. Data are being recalculated with a different set of curves to account for a difference in calcium content.

3. Five specimens of St. Paul's Rock were examined by x-ray diffraction.

Results on the Ludlow olivine nodule and St. Paul's Rock will be included in our next report.

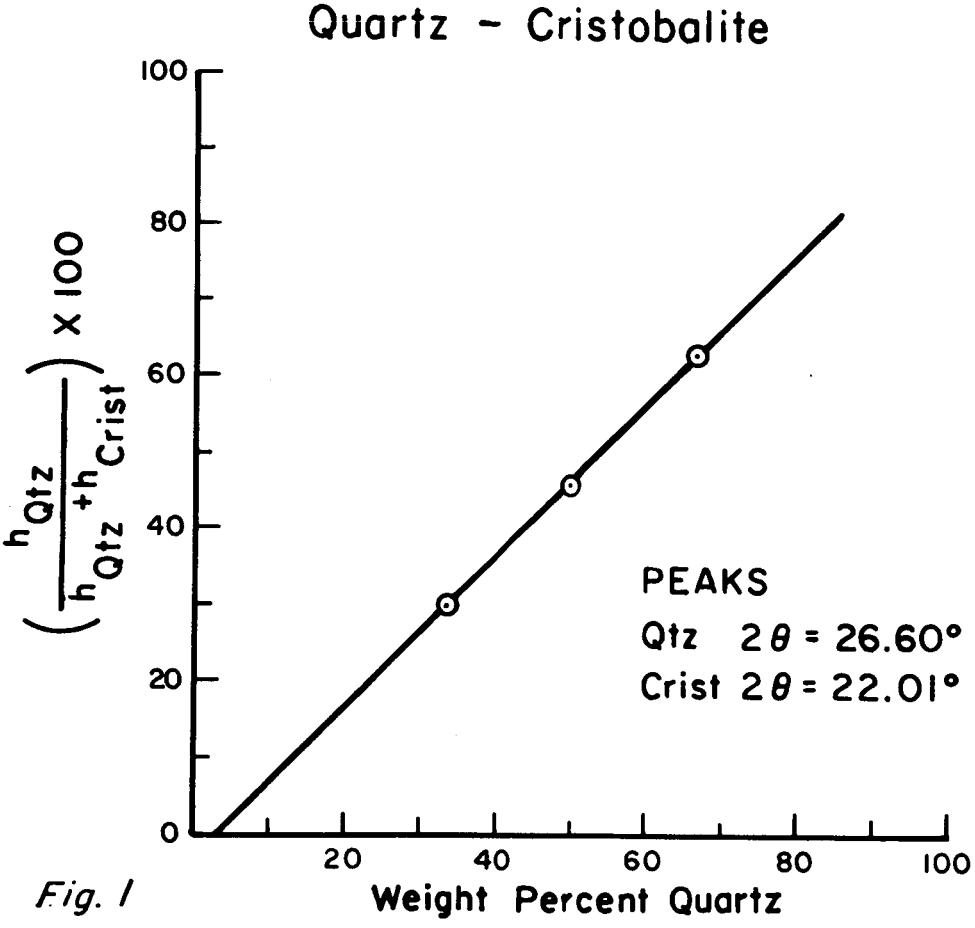
Quartz - Cristobalite
100
80
60
40
20
0
20
40
60
80
100
$\left(\frac{h_{Qtz}}{h_{Qtz}+h_{Crist}}\right) \times 100$
Weight Percent Quartz
PEAKS
Qtz 2θ = 26.60°
Crist 2θ = 22.01°

Fig. 1

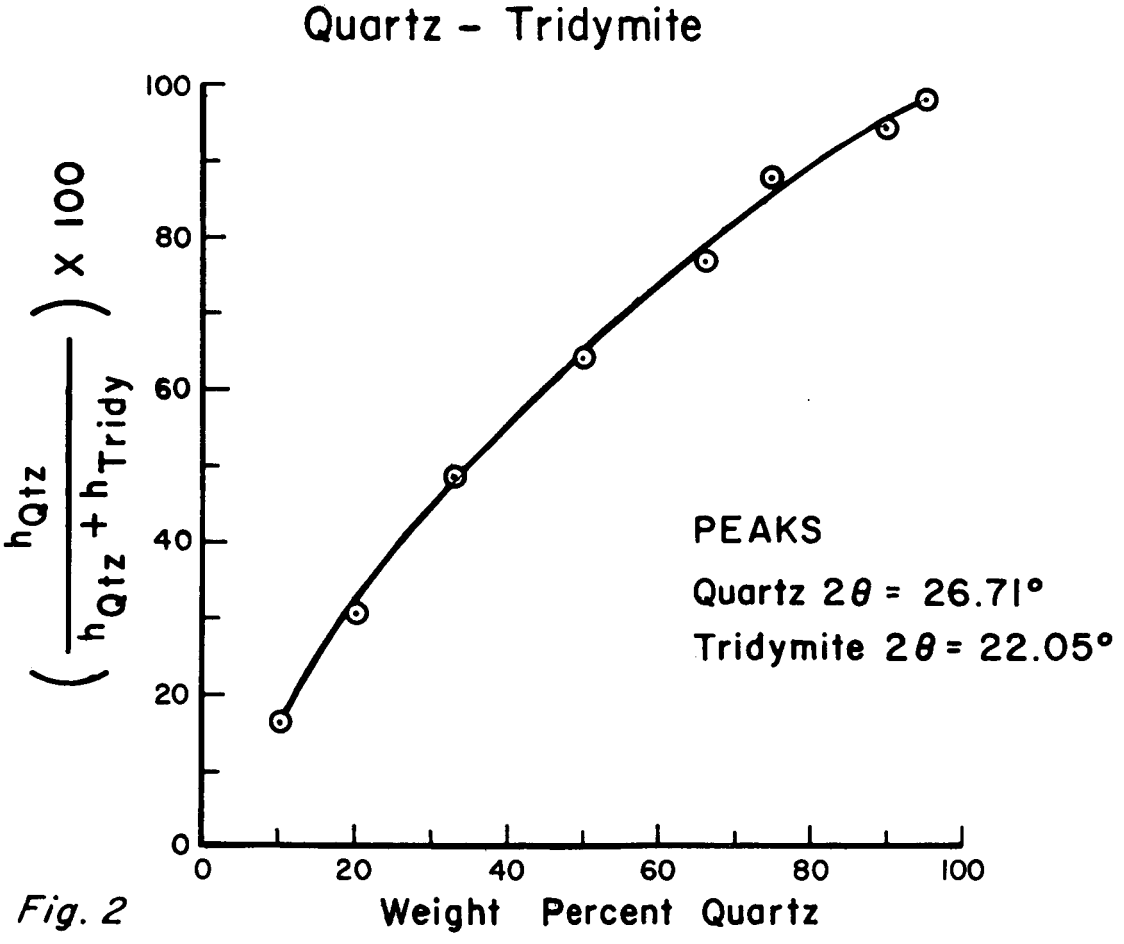
Quartz - Tridymite
$\left(\frac{h_{Qtz}}{h_{Qtz}+h_{Tridy}}\right) \times 100$
100
80
60
40
20
0
0
20
40
60
80
100
Weight Percent Quartz
PEAKS
Quartz 2θ = 26.71°
Tridymite 2θ = 22.05°

Fig. 2

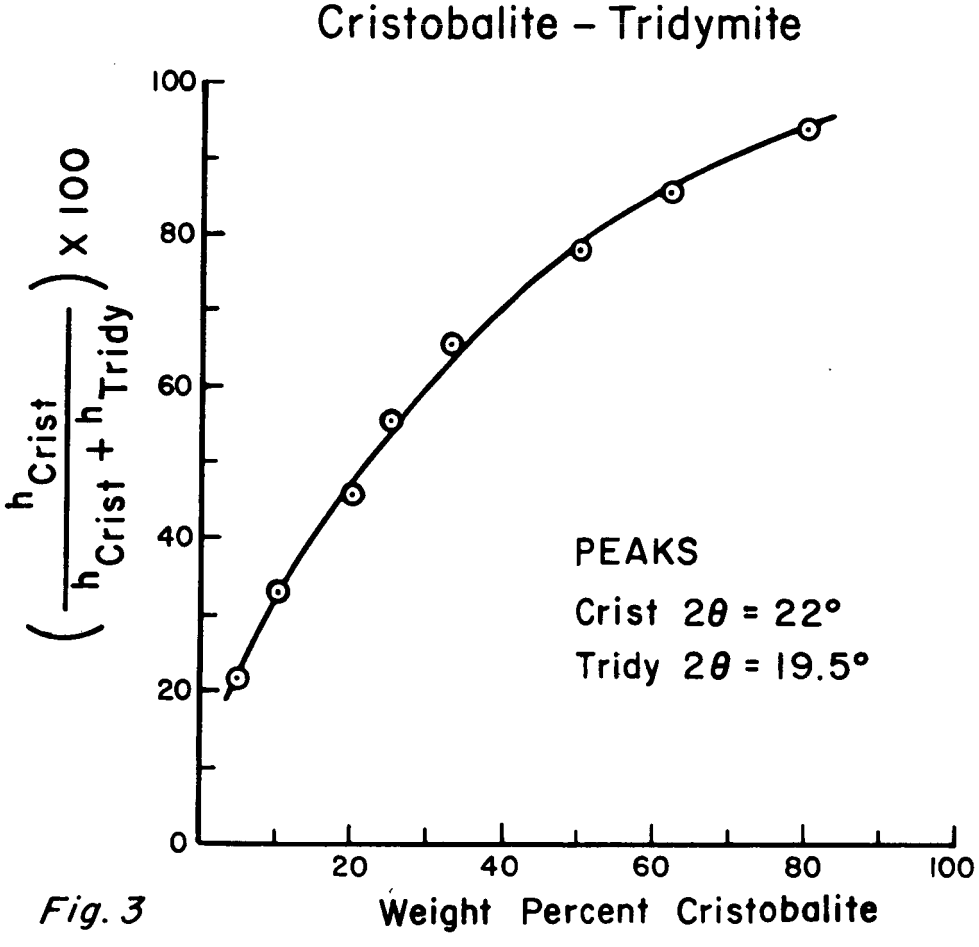
Cristobalite – Tridymite
$\left(\frac{h_{Crist}}{h_{Crist} + h_{Tridy}}\right) \times 100$
100
80
60
40
20
0
20
40
60
80
100
PEAKS
Crist 2θ = 22°
Tridy 2θ = 19.5°
Weight Percent Cristobalite

Fig. 3

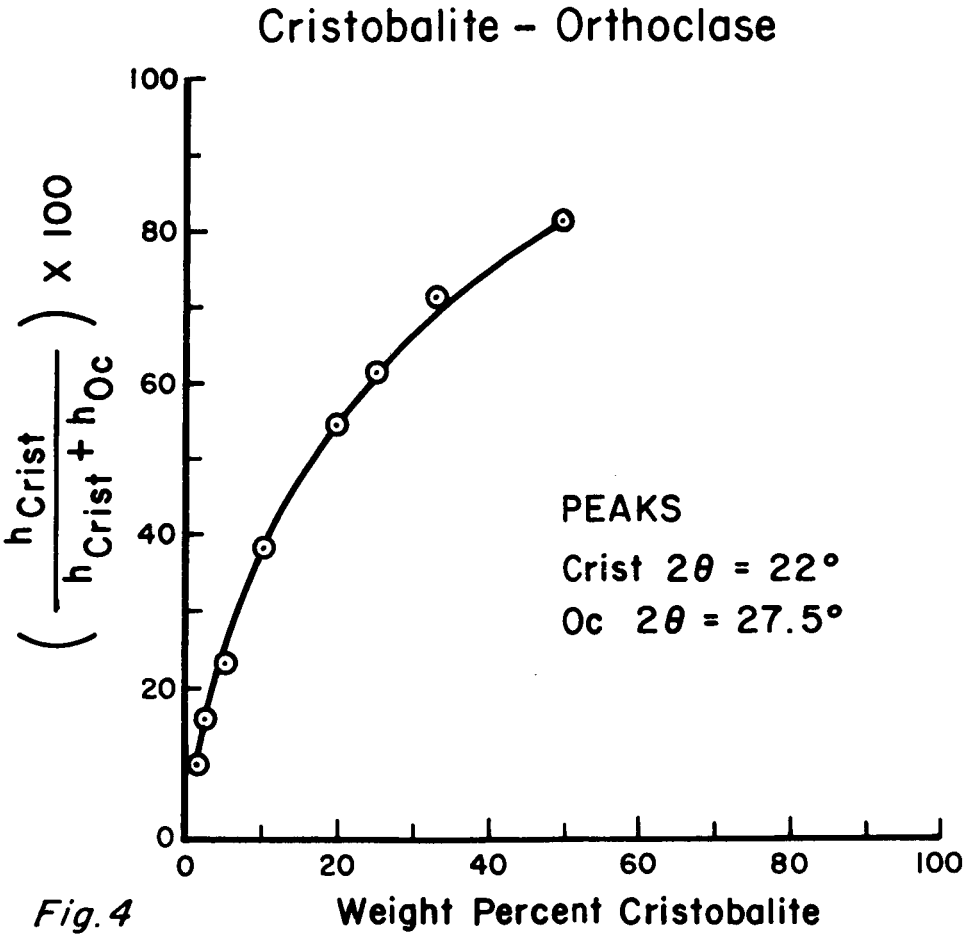
Cristobalite – Orthoclase
$\left(\frac{h_{Crist}}{h_{Crist}+h_{Oc}}\right) \times 100$
100
80
60
40
20
0
0
20
40
60
80
100
PEAKS
Crist 2θ = 22°
Oc 2θ = 27.5°
Weight Percent Cristobalite

Fig. 4